REVIEW OF DIABETES MELLITUS DIETARY MANAGEMENT INFORMATION AVAILABLE ON VARIOUS WEBSITES.

Fatima Adam, Dr. Shobha Udipi, Ms. Salome Benjamin

Student M.Sc , Professor, Professor

Department of Food Science, Nutrition and Dietetics

SVT College of Home Science

Mumbai, India.

Abstract : The aim of the study was to assess the quality of Type 2 Diabetes Mellitus dietary management information available on various websites in the form of blog posts and compare it with the International Diabetes Federation guidelines in order to check the authenticity of the information provided. With the emergence of blogs in the world of technology, critical assessment of Dietary management information of Diabetes Mellitus available online is of utmost importance. A literature search on the Google search engine was conducted between January and February 2019 in India using certain key words and content analysis was the method to assess the quality of information provided. Most of the blogs were authored by Individuals with type 2 Diabetes Mellitus and a lot of the information provided was not as per the IDF guidleines. Though there is abundant of information related to diet ary management of type 2 Diabetes, the quality of information provided is not up to the mark and there is scope for further research in this area.

IndexTerms **- Diabetes, Diabetes Mellitus management, Dietary management, Blogs, International Diabetes Federation guidelines, Dietitians, Diabetologist.**

I.INTRODUCTION

1.DIABETES

1.1 DIABETES PREVALENCE GLOBALLY AND IN INDIA

Over the past few decades, the prevalence of diabetes has increased significantly. (Unnikrishnan, et al., 2017) According to the International Diabetes Federation, in 2017, in the age group of 18–99 years, there were 451 million people with diabetes worldwide. . The western Pacific region saw the largest number of people living with diabetes which was approximately 168 million people. (Cho, et al., 2018) However, Diabetes is not just a disease affecting the European and western countries; it is emerging to be a global pandemic with China and India in the lead. (Unnikrishnan, et al., 2017) As of 2017, there were 109.6 million people living with diabetes in China and 69.2 million people in India.(Unnikrishnan, et al., 2017). By 2030, International Diabetes Federation estimated that India will have 100 million people with diabetes. (Shetty, 2012)There was general consensus that the region of South Asia will include three of the world's top ten countries (India, Pakistan and Bangladesh) in terms of the estimated absolute number of people with diabetes. (Sicree, et al., 2009) The aetiology of Diabetes is multifactorial in India including obesity associated with rising living standards, steady urban migration, and lifestyle changes. (Kaveeshwar, et al., 2014)

This disease that is so widespread is essentially a metabolic disorder characterized by high levels of blood sugar over an extended period of time. The symptoms include frequent urination, increased hunger and thirst. If it is not treated, it can cause acute complications such as diabetic ketoacidosis, hyperosmolar hyperglycemic state, etc. and chronic complications like cardiovascular diseases, chronic kidney disease, microvascular and macrovascular damage, etc. Diabetes Mellitus can be categorized into three main types - Type 1 Diabetes Mellitus in which the pancreatic beta cells are damaged and are unable to produce Insulin. Type 2 Diabetes Mellitus begins with Insulin resistance wherein the cells do not respond adequately to the existing Insulin. With disease progression, reduced Insulin production may also develop. Gestational Diabetes occurs in pregnant women without prior history of diabetes. It may disappear completely after delivery.

1.2 SELF MANAGEMENT OF DIABETES

Diabetes management through self education is important and effective. The paradigm of diabetes management has been shifted to focus on empowering the person with diabetes to manage the disease successfully and to improve their quality of life. It is a complex disease and does not have any one specific treatment for all patients. Therefore, individualizing treatment by considering all the available options and then selecting the most appropriate treatment plan for a particular individual is of utmost importance. Management generally focuses on regulating the blood sugar levels which could be achieved by lifestyle modifications such as following a healthy diet, engaging in some amount of exercise, losing weight and using appropriate medicines like oral hypoglycaemic agents and insulin. Earlier patients would rely solely on their health care providers for disease related information. However, over the years the internet has emerged as one of the primary sources of health related information. The use of technology has been increasing day by day. People have been resorting to the internet for information on any and every subject of interest. It has become a very powerful platform that has changed the way that people communicate. ("Internet growth statistics" https://www.internetworldstats.com/emarketing.html)

1.3 SOURCES OF INFORMATION FOR PEOPLE LIVING WITH DIABETES

Back in the day, Physicians, nurses, and dietitians were the primary sources of Diabetes related information. It was found that people living in rural communities would rely more often on a pharmacist for diabetes related information. (Kay, et al., 1999) Over the years people with diabetes obtain information related to Diabetes from various sources. Newspapers, magazines, media, radio and internet along with health care professionals, are the different sources that are used by people living with diabetes for information. Today, in the information technology era, diabetic patients have become more dependent on online sources for ubiquitous access to health information, particularly with smartphone, tablet, and laptop propagation. As use of the Internet has grown, its uses for health - related purposes have also grown. It is possible that the most common is the search for information about the health of consumers. (Cline, et al., 2001) With the evolution of the World Wide Web, now commonly referred to as Web 2.0, the role of the Internet in health care has grown significantly. Cormode explained that the essential difference between Web 1.0 and Web 2.0 is that content creators were few in Web 1.0 whereas any participant can be a content creator in Web 2.0. (Cormode, et al., 2008)

In health care, owing to the rapid proliferation of information on the internet related to health, more patients have found themselves turning to the internet as their primary source of health information and gaining knowledge of their health conditions prior to seeking a professional diagnosis. (Tan, et al., 2017) Independent online inquiries can complement and be used in synergy with clinical doctor-patient interactions, which are often very time-constrained. (Tonsaker, et al., 2014) With such a surplus of information available at one's finger tips, patients feel more empowered and are favourably disposed towards being engaged in their health. (Tan, et al., 2017) Access to reliable and high - quality information on health and appropriate medical advice can contribute to a dramatic reduction in the mortality figures of countries. (Novillo, et al., 2017)

1.4 INTERNET INTERVENTION

User - generated content is Web 2.0's hallmark which is responsible for the Internet's remarkable growth in health - related content. This is reflected in tools that range from Twitter to wikis to social networking sites. The blog (weblog short) is the quintessential application of Web 2.0. (Miller, et al.,2010) The term blog was first introduced in 1997. Blog features commonly include archives which consist of previous posts, typically grouped by month and year, a blog roll which is basically a list of recommended blogs, and a reader comment section. (Herring, et al., 2004) In today's day and age, anyone and everyone is writing blog posts. These write ups have become the new source of information and entertainment. It has become easy to write blogs owing to the fact that presently, modern and advanced free software such as Blogger and Wordpress is available which does not require the individual to have any programming knowledge whatsoever. (Sauer, et al., 2005

By providing educational and motivational support, technology can be used to supplement diabetes care for health care providers. (Hunt, et al. ,2015) It can also be used to extend education and support for people with type 2 Diabetes when primary care resources are insufficient or patient resources are limited and access to care is limited (Hunt, et al. ,2015) Most of the times people who have been affected by a particular health condition write about their personal experiences which provides other individuals who may be going through similar experiences, a source of emotional support.

Even though there is ample evidence which indicates the benefits of using the internet as a source of information, the regulation of online health information has been burdensome which makes quality control a challenge. Also, the literacy of health information among patients is varied. (Tan, et al., 2017) The health information provided on the internet may not always be authentic and this could be detrimental for the management of disease conditions. Doctors are concerned that the unnecessary information provided on the Internet may aggravate the cost of health care through non - essential referrals or treatments which may burden the individual economically. (Tan, et al., 2017)

Limited studies have been reported in the literature which assess the quality of health related information available online however more research is needed in this area. There is a lack of Indian data in this context and the few studies which have been done focus solely on international websites. There are some websites which provide accurate and authentic information related to Diabetes however they are limited in number and not many people know about them. Only if the individual is told about these websites will they find them as the internet is over filled with information provided by unknown writers and the information available may not be in accordance with the scientific data available. Thus, it is of utmost importance to evaluate the quality of

Diabetes-related dietary management information available on websites in India and to compare them with evidence-based guidelines available.

II. RESEARCH METHODOLOGY

2.1 STUDY DESIGN AND PROCEDURE

This qualitative study has used Content Analysis as a method to assess the quality of information in the blogs available on various websites. There are limited studies done which assess the quality of health related information available online however they are done using information obtained from International Websites. A lack of Indian data is seen in this area, thus this study was done using only Indian websites. This study analysed 60 Indian Web blog posts related to diet and physical activity in type 2 Diabetes Mellitus management which were available on 8 eight different websites. The posts in the websites were considered for this study between the years 2014 and 2018. The information obtained from these blogs was analysed and compared with the International Diabetes Federation guidelines (2017) for T2DM management. This study has been undertaken to understand the content in the blogs available and to assess whether good quality information which was in accordance with the IDF guidelines was provided.

2.2 SELECTION OF WEB BLOG POSTS

Inclusion Criteria

- Indian web blog posts published between the time frame of 2014 and 2018 were selected.
- The study included the blog posts which were a minimum of one page and maximium of 3 pages.
- The blog posts related to diet and physical activity in type 2 Diabetes Mellitus management were included in this study.
- The blog posts which were written in English were included in this study.

Exclusion Criteria

- The web blog posts published by International sources were excluded from this study.
- Half or one fourth page blog posts were excluded from the study.
- The blog posts which were about different aspects of type 2 diabetes management (such as medications, Insulin, mental health) which were not related to Diet and physical activity in type 2 Diabetes management were not selected in this study.
- The blog posts that were selling a product or service such as anklets, hair transplant medications which was not related to the management of type 2 Diabetes were excluded from the study.

2.3 SEARCH STRATEGY

A literature search on the Google search engine was conducted using the key words “Diabetes Mellitus and diet”; “Diabetes Mellitus and Education”; “Type 2 Diabetes Mellitus and treatment”; “Diabetes and management”; “Gestational Diabetes and diet”; “Gestational diabetes and management”. This search found 47 relevant websites which possessed information related to Diabetes Mellitus.

2.3.1 SELECTION OF WEBSITES

Figure 2.3.1 shows the flow chart of the websites which were viewed and included.

In this study, 47 websites which were related to Diabetes Mellitus management were located and viewed at random in the time period of January, 2019 to February, 2019. Those which were International Websites were excluded from the study. 35 Websites were found to be International websites hence these were excluded from the study.

The remaining 12 were Indian websites. Out of these, 4 websites were excluded due to the following reasons: Only recipes were provided, no information related to type 2 Diabetes Mellitus and its management including diet and physical activity, making an account was necessary for access of information, contained blog posts which did not meet the inclusion criteria. 8 websites were selected for Content Analysis which consisted of 60 blog posts altogether.

2.4 ASSESSING THE BLOG POSTS

The 60 blog posts selected were further screened for the author and their qualifications if provided. The blog posts were categorized into blogs published by lay people, Medical professionals, Dietitians and Health websites. The content was analysed based on the following category: Diet in the management of type 2 DM which included type of food which should be consumed, foods which should be avoided, consumption of artificial sweeteners, consumption of super foods, consumption of coffee, restriction of calories, fad diets, consumption of meal replacements, green tea consumption, etc. as well as Physical activity in the management of type 2 Diabetes Mellitus and lifestyle management. The information obtained was compared to the recommendations provided by International Diabetes Federation. This information was tabulated.

The IDF guidelines were selected as the criteria for assessment of the quality of type 2 diabetes management related information available on the websites. The reason for this was that these recommendations are universally accepted and applicable and are not specific to any particular country. The IDF Clinical Practice Care guidelines for type 2 DM (2017) provide recommendations on the type of food which should be consumed, the foods which should be avoided, physical activity, lifestyle management, diabetes education among other aspects.

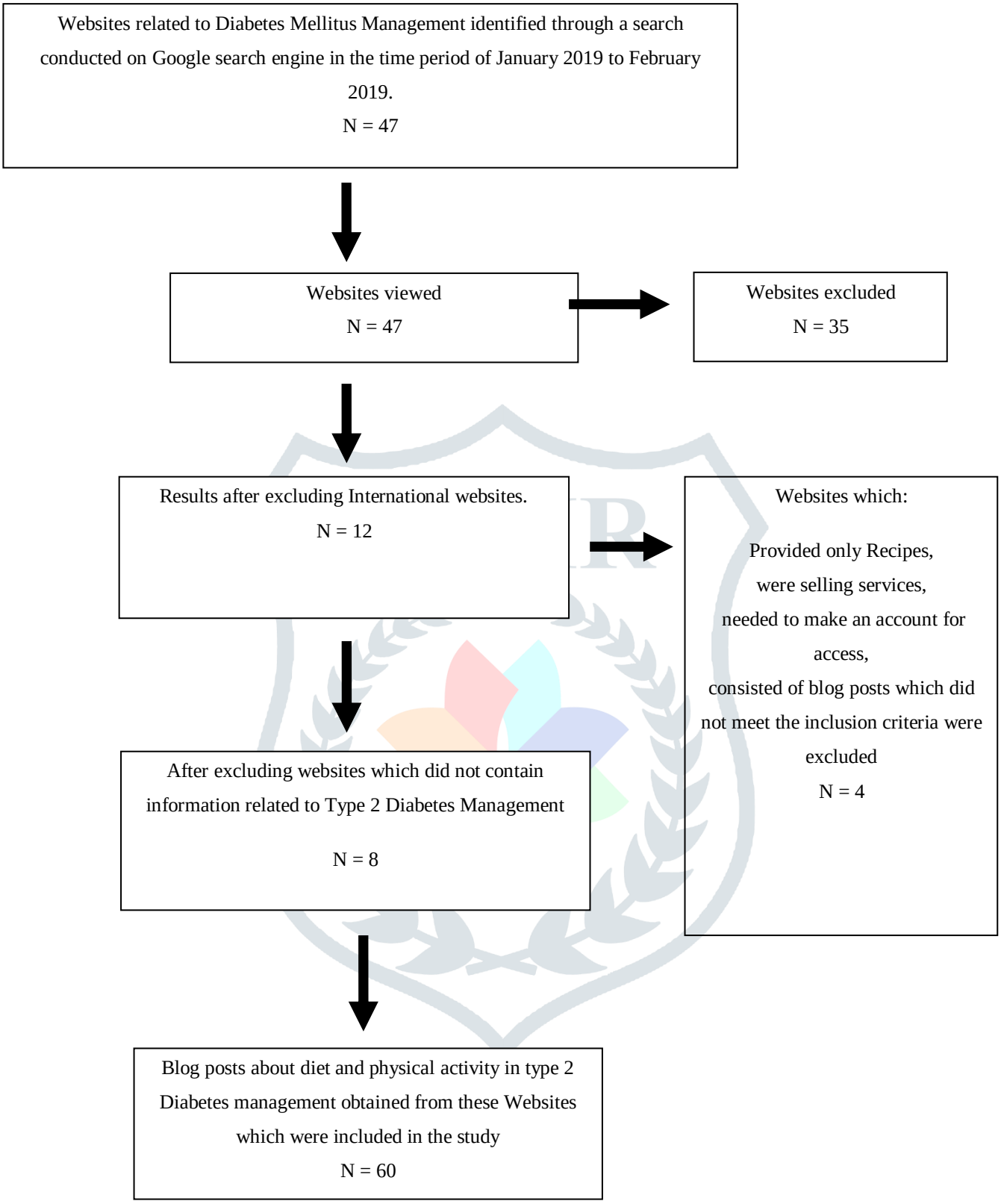

Figure 2.3.1: SELECTION OF WEBSITES

FIGURE 3.3.1: SELECTION OF WEBSITES

III. RESULTS AND DISCUSSION

3.1 INFORMATION ABOUT THE AUTHORS OF THE BLOGS WHICH WERE REVIEWED:

The study reviewed 60 blogs and it was found that 28 blogs were authored by lay people, 15 blogs were authored by Diabetologists, one was authored by an endocrinologist and one was authored by a cardiologist. Four blogs were written by Dietitians and Nutritionists and 11 blogs were obtained from health websites which did not mention the authors' specifications but it was stated that they were approved by their team of health professionals including Dietitians, fitness trainers and doctors. (Figure 3.1.1)

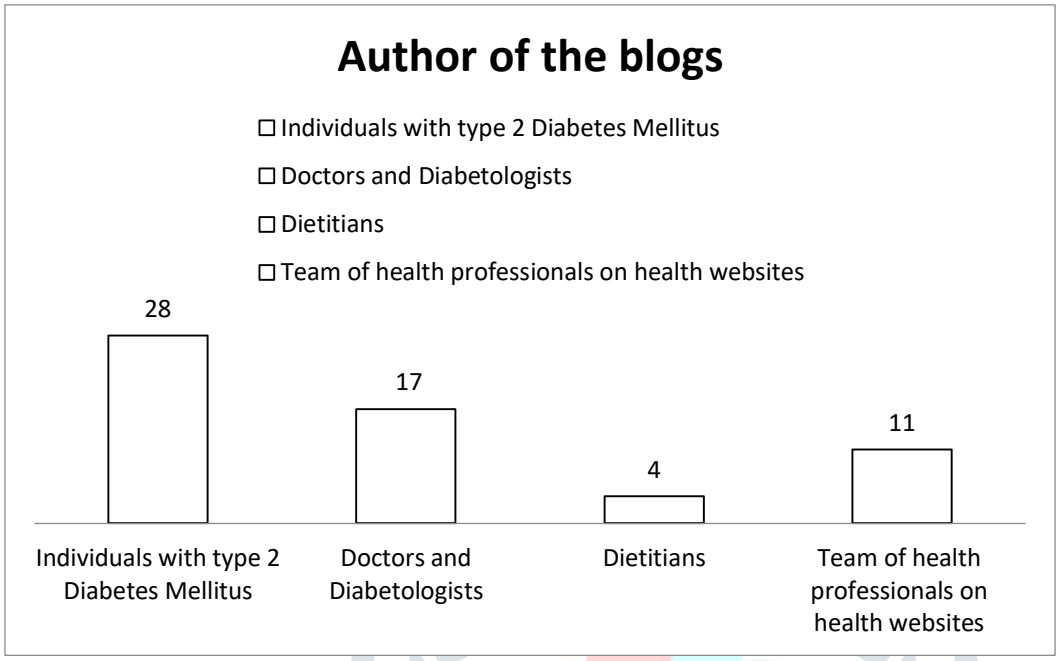

FIGURE3.1.1: BACKGROUND OF THE AUTHORS OF THE BLOGS

3.2 Diet in the Management of Type 2 Diabetes Mellitus:

The IDF guidelines stated that *"Overweight and obese patients with T2D should reduce daily caloric intake by 500 to 600 calories and when possible they should be referred to a dietician who will help them to follow a low-calorie diet (800 to 1200 calories per day).*
Some guidelines specifically consider the composition of the macronutrients in the diet and describe the Mediterranean diet as a beneficial example. It may not be appropriate everywhere, but the patient should be advised to prefer high-fiber and low-glycemic index foods, which may be found in local lists of foods. Three to five daily portions of vegetables and/or fruits, fish, grains and monounsaturated fats are good choices. Sugar, sweets and sweetened beverages should be avoided.")
This study found that majority of the blogs provided information related to diet in the management of type 2 DM.

3.3. TIMING OF THE MEALS:

3.3.1. IMPORTANCE OF EATING BREAKFAST:

Two blogs written by dietitian and a team of health professionals respectively mentioned the benefits of eating breakfast. The blog written by a dietitian stated that "*breakfast should be eaten as soon as possible after waking up."* The explanation provided was that the long gap where no food being consumed would trigger the activity of counter regulatory hormones which in turn increased the blood glucose levels. However there was no reference of scientific literature provided for this explanation. In one blog it was mentioned that "*skipping breakfast increases insulin resistance"* explanation was provided for its mechanism and a research study was described in detail which backed the information provided.

3.3.2 INTERMITTENT FASTING

Two blogs written by diabetologists recommended intermittent fasting to manage type 2 diabetes mellitus. One of the blogs did not provide any explanation for this recommendation and reference of scientific literature was not provided. Another blog mentioned the benefits of intermittent fasting on glycemic control and also stated that it leads to improved insulin sensitivity. The phrase "various research has shown" was mentioned in the blog however references of literature were not provided.

3.4 CARBOHYDRATE COUNTING

There was no IDF guideline which suggested use of carbohydrate counting in type 2 DM management. Six blogs were identified which mentioned the amount of carbohydrate which should be consumed and/or carbohydrate counting. Four blogs written by people with type 2 DM and one blog written by a dietitian mentioned that carbohydrate counting is beneficial in the management of type 2 diabetes. They stated that the amount of carbohydrate is more important than the type of carbohydrate consumed. Only one blog which was written by a person with type 2 DM provided reference of scientific literature to support the recommendation while the other blogs did not include any reference of scientific literature in the blogs. Three blogs specified the amount of carbohydrate content in each meal. The information varied between different blogs. One blog stated that "*the amount of carbohydrate should be limited to 45-60 grams in every meal"*, another blog mentioned that "*the carbohydrate content in each meal should not be more than 20 – 25 grams"* while one more blog declared that "*the carbohydrate content in each meal should be limited to 12 grams."* It was mentioned as a way of explanation that limiting the carbohydrate content would help in better glucose management. None of the blogs provided any reference of evidence based literature for these recommendations. (Table 3.4.1)

3.5 MILK CONSUMPTION

Two blogs provided information on milk. Both were authored by individuals with type 2 Diabetes Mellitus. One blog stated that 2-3 cups milk should be consumed in a day. The explanation provided was that milk is beneficial in metabolic disorders and increases good cholesterol in the body. Consumption of skim milk was recommended and the explanation given was that it is beneficial in weight loss. Camel milk was recommended and the justification provided was that it increases insulin sensitivity Reference of American Diabetes Association was mentioned in the blog. Another blog mentioned that Paneer and curd should be consumed but milk should be avoided. There was no explanation provided for the same and reference of scientific literature was not provided. (Table 3.4.1)

3.6 OTHER TYPES OF FOOD CONSUMED:

3.6.1 SUPER FOODS:

There was no IDF guideline for the consumption of super foods. Nine blogs mentioned that consumption of specific foods is beneficial in the management of type 2 Diabetes Mellitus. Two blogs were authored by individuals with type 2 Diabetes. In one blog it was stated that bay leaves, bitter gourd, blackberries, mango leaves, fenugreek seeds should be had. The explanation provided was that these foods improve insulin resistance and insulin sensitivity however no reference of scientific literature was provided. Another blog stated that lemon should be consumed as it has a low glycemic index. Reference of American Diabetes Association was mentioned. Three blogs authored by diabetologists mentioned that amla, honey, ashwagandha, jamun, fenugreek seeds, cinnamon, lemon, onion powder, etc. should be consumed. Two/three blogs did not provide an explanation with respect to the beneficial properties of these foods in glycemic control. Only one blog mentioned the phrase "various researches show" but reference was not provided. Two blogs were written by dietitians. One of them stated that Apple is beneficial in controlling the blood sugar levels however no explanation was provided. A research study was described in the blog to back the recommendation but the reference was not provided. Another blog mentioned the beneficial properties of turmeric in glycemic control and it was recommended to consume turmeric before sleeping. Explanation of the mechanism and reference of scientific literature was provided. Two blogs were obtained from health websites. Of these, one blog mentioned the benefits of consumption of jamun seeds in glycemic control. There was an explanation provided for the mechanism and "research has shown" was just mentioned but there was no reference of literature provided. Another blog mentioned that *"Bitter gourd juice and fenugreek should be consumed early morning."* The explanation provided was that fenugreek slowed the absorption of sugars in the stomach and stimulated insulin secretion thus helping in glycemic control. Reference of scientific literature was not mentioned in the blog.

3.6.2 DIABETES FRIENDLY DESSERTS:

There is no IDF guideline on the consumption of diabetes friendly desserts. Three blogs provided information on consumption of diabetes friendly desserts. Two blogs written by individuals with type 2 DM mentioned that diabetes friendly desserts can be eaten as the sugar content is low in these products but portion size should be controlled. No specifications were mentioned regarding the serving size. One blog written by a dietitian mentioned that consumption of sugar free desserts should be avoided as they may contain other ingredients which are rich in fats and calories. Reference of scientific literature was not provided by any of the blogs.

3.7 DIFFERENT DIETS IN THE MANAGEMENT OF TYPE 2 DM:

TABLE 3.7.1: TOTAL NUMBER OF BLOGS PROVIDING INFORMATION ON FAD DIETS.

Fad diets	Total number of blogs	Author of the blogs				
		Dietitian	Diabetologist	People with type 2 DM	Team Website	Cardiologist
Avoid Fad Diets	2			1		1
Low carbohydrate diet is beneficial in the management of type 2 DM	2		1	1		

3.7.1 KETOGENIC DIET:

Four out of sixty blogs provided information about the Ketogenic diet. Two blogs promoted the ketogenic diet and stated that it "*lowers the risk of type 2 DM"* and that "*the type of food consumed in a keto diet lowers blood glucose levels"* Of these two blogs, one blog condemned the American Diabetes Association stating that "*eating low glycemic index foods as recommended by ADA is not promising for long term control of blood glucose and that a ketogenic diet must be followed for the hbA1 levels to decrease and to help diabetics stop their medication completely."* The phrase "various research shows" was mentioned in both the blogs although reference was not brought forth. Both the blogs were written by Diabetologists. The other two blogs did not promote the ketogenic diet stating that "*this kind of restrictive diet increases the risk of type 2 Diabetes Mellitus and that it is seen to be beneficial in weight loss but must be followed strictly for a short period of time*." There was no explanation provided however reference of scientific literature was given. These blogs were acquired from health websites where the information provided was approved by a team of health professionals however information about the author was not disclosed.

3.7.2 FAD DIET:

There was no IDF guideline which recommended following any particular diet in the management of type 2 DM. Table 4.3.5.1 shows the number of blogs which revealed information on Fad diets and provides information with respect to the author of the blogs.

Two blogs did not favour the fad diets and mentioned that such kind of diets are not beneficial for long term use. A diabetologist mentioned that low carb diets are effective in the reversal of type 2 Diabetes mellitus and hence should be followed. Another blog written by a person with type 2 DM mentioned that for effective blood glucose control low carbohydrate diets should be followed. None of the blogs provided any reference of scientific literature.

3.8 ADDITIONAL INFORMATION PROVIDED:

3.8.1 COFFEE CONSUMPTION:

There is no IDF guideline regarding consumption of coffee. Three out of sixty blogs written by individuals living with type 2 DM provided information on coffee. One blog mentioned that consumption of coffee should be avoided due to its high calorie and fat content. There was no reference of scientific literature. Another blog mentioned that 1-2 cups of coffee can be consumed and not more as it increases the blood glucose levels however it should be consumed on an empty stomach. The blog mentioned the phrase "various researches have shown" but reference of the research study was not provided. One blog mentioned that thick cream should be added in coffee instead of milk. The justification given was that milk and sugar are rich in carbohydrate which raises blood sugar levels. The phrase "various researches show" was mentioned but reference of scientific literature was not provided.

3.8.2 Sugar Cane juice consumption:

One blog recommended the consumption of sugar cane juice. The explanation provided was that sugar cane has natural sugars which is low in glycemic index and prevents blood glucose spikes however there was no reference of scientific literature given to support this recommendation. There was no IDF guideline which recommended the consumption of sugar cane juice.

3.8.3 Vinegar:

One blog authored by a person with type 2 DM stated that "consuming a spoon of vinegar everyday helps in lowering the blood sugar levels" explanation for the mechanism was provided but there was no reference of scientific literature. IDF guideline for this recommendation was not present.

3.8.3 Limit Certain Fruits:

Seven blogs provided information on consumption of Banana, Grapes, Watermelon, Custard Apple, Chiku, Mangoes. Three blogs authored by individuals with type 2 DM mentioned that Banana, water melon and grapes should be avoided. Explanations which were provided stated that the sugar content is high in these fruits which lead to blood glucose spikes however there was no reference of scientific literature given.

One blog written by a diabetologist and 2 blogs written by dietitians stated that consumption of Mango, Chiku, Grapes and Custard Apple should be avoided. The blogs which were written by dietitians provided an explanation for this recommendation however thereand there was no reference of scientific literature given. The recommendations of one blog obtained from a health website were similar to the recommendations given by the blogs written by dietitians. Explanation and reference of scientific literature to support the information was also provided.

3.8.4 Minimise Consumption of Potato:

Three blogs mentioned that consumption of Potato should be avoided. These blogs were written by a person with type 2 DM, a diabetologist and a dietitian each. Justification for this recommendation was only given in the blog authored by a dietitian and it was also mentioned that beet roots and carrots should also be minimally consumed. Nonetheless reference of scientific literature was not provided by any of the blogs. There were no IDF guideline available on this subject.

3.8.5 Cinnamon:

Seven blogs mentioned that consuming cinnamon is beneficial in lowering blood glucose levels and for overall glycemic control. Two blogs were authored by Dietitians, two by diabetologists, two by individuals with type 2 DM and one blog was obtained from a health website. All the blogs provided an explanation for this recommendation, in spite of that, only two blogs authored by a diabetologsist and a person with type 2 DM respectively imparted references of scientific literature. There was an absence of IDF guideline on this topic of interest.

3.8.6 Consumption of Green Tea:

Even though there is no IDF guideline which recommends the consumption of green tea, two blogs written by a person with type 2 DM and a diabetologist each indicated that Green tea helps in preventing type 2 DM and improves insulin sensitivity along with aiding in weight loss. The blog written by a person with type 2 DM mentioned the phrase "various research shows" but there was no reference of the research article to prove the statement.

3.8.7 Drink Plenty of Water:

10 % blogs (n=6) mentioned that adequate amount of water must be consumed throughout the day. The explanation provided was that drinking water prevents dehydration and also keeps the blood glucose levels in check as it is free of calories and carbohydrate as opposed to drinking sugar laden beverages which raise blood sugar levels. This recommendation was supplied in blogs written by individuals with type 2 DM and a diabetologist. There was no reference of scientific literature provided to support this recommendation and there is no IDF guideline on this subject as well.

DISCUSSION

This study highlights the challenges which are faced by people who wish to seek diabetes- related information online and the importance of developing tools that would help users seek, evaluate and analyze recent information. There is scope for future research to develop a tool to evaluate the information available online. Some of the recommendations given in the blogs may have detrimental consequences. The accepted recommendations such as exercise, weight loss, healthy, balanced diet are proper management strategies for type 2 DM. However other recommendations such as following a very low calorie and carbohydrate diet or intermittent fasting may not be beneficial due to the risks associated with them. If these are to be followed they must be done under medical supervision. Use of super foods which were endorsed by quite a few blog posts have no proven benefits and were not recommended by the IDF guidelines. Some pages mentioned certain recommendations which did not have any scientific evidence for the reversal or cure of type 2 DM. Such recommendations are very detrimental as users may get false hopes in terms of their disease getting cured. Many of the web blog posts provided information about the authors. Despite there being a large amount of health- related information available online, limited studies have assessed and analysed the content. This study makes it clear that not all the information provided by blogs is accurate and authentic as per the recommendations given by International Diabetes Federation. Inaccurate information, if provided to the population will lead to inappropriate and/or poor management of type 2 DM and increase the risk of complications. The study highlights the need to develop a tool which can analyse the information online and verify the accuracy of the information provided. Also, recommendations for authentic blogs which give accurate information could be provided to the community which will make internet based self education and management of type 2 diabetes easier.

ACKNOWLEDGMENT

I would like to begin by thanking the principal of Sir Vithaldas Thackersey College of Home Science (Autonomous), Dr. Jagmeet Madan, for giving me this opportunity and facilitating this process effectively.

I offer my sincerest gratitude to my thesis advisor Dr. Shobha Udipi for her constant support throughout my thesis with her patience and knowledge whilst allowing me the room to work in my own way. Her guidance helped me in all the time of research and writing of this thesis.

I would like to thank my thesis co advisor Ms. Salome Benjamin for her constant motivation and valuable advice without which I would not have been able to complete this thesis.

I am deeply indebted to Ms. Anuradha Ramesh. Without her continuous guidance, motivation, encouragement, unwavering support and affectionate attitude this thesis would not have been possible. I am obliged to my teachers for their assistance and encouragement to accomplish this endeavour.

Finally, I take this opportunity to express my heartfelt appreciation to my parents, who experienced all the ups and downs of my research work with me, for their unfailing support, love, patience and encouragement. I would also like to thank my siblings and friends for their valuable inputs, assistance and encouragement. Completing this thesis would have been difficult without them.

REFERENCES

1) Adams SA (2010), Blog-based applications and health information: two case studies that illustrate important questions for Consumer Health Informatics (CHI) research. Int J Med Inform 79(6):e89-96
2) Amy Bradshaw Kaiser, Nicole Zhang,Wouter Van Der Pluijm (2018) Global Prevalence o Type 2 Diabetes over the Next Ten Years (2018-2028). 67(Supplement Diabetes Journals
3) Association between information sources and level of knowledge about diabetes in patients with type 2 diabetes KatherineCántaro[a]Jimena
4) A.Jara[a]MarcoTaboada[ab]PercyMayta-Tristán (2016), Endocrinología y Nutrición, Volume 63, Issue 5, Pages 202-211
5) Barak A, Klein B, Proudfoot JG Ann Behav (2009); Defining internet-supported therapeutic interventions. Med. 38(1):4-17.
6) Block, G., Azar, K. M., Romanelli, R. J., Block, T. J., Hopkins, D., Carpenter, H. A., Dolginsky, M. S., Hudes, M. L., Palaniappan, L. P., Block, C. H. (2015). Diabetes Prevention and Weight Loss with a Fully Automated Behavioral Intervention by Email, Web, and Mobile Phone: A Randomized Controlled Trial Among Persons with Prediabetes. *Journal of medical Internet research*, *17*(10), e240. doi:10.2196/jmir.4897
7) Brodkin, John "First website ever goes back online on the open Web's 20th birthday "*Ars Technica*. April 30, 2013.
8) Bull SS, McKay HG, Gaglio B, et al. (2005),Harnessing the potential of the Internet to promote diabetes self-management: How well are we doing? Chronic Illn. 1(2):143–155
9) Burke LE, Warziski M, Starrett T, et al. (2005), Self-monitoring dietary intake: current and future practices. J Ren Nutr.;15:281–90.
10) Conroy DE, Yang CH, Maher JP. (2014), Behavior change techniques in top-ranked mobile apps for physical activity. Am J Prev Med.;46:649–52.
11) Cormode G, Krishnamurthy B. (2008), Key differences between Web 1.0 and Web 2.0. FirstMonday ;31(6) http://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2125/1972.
12) David R. Whiting,Leonor Guariguata, Clara Weil, Jonathan Shaw. (2018), IDF Diabetes Atlas: Global estimates of the prevalence of diabetes for 2011 and 2030
13) Dayer L, Heldenbrand S, Anderson P, Gubbins PO, Martin BC. (2013), Smartphone medication adherence apps: potential benefits to patients and providers: response to Aungst. J Am Pharm Assoc.;53:345.
14) Glasgow RE, Kurz D, King D, Dickman JM, Faber AJ, Halterman E, Wooley T, Toobert DJ, Strycker LA, Estabrooks PA, Osuna D, Ritzwoller D J (2010)Outcomes of minimal and moderate support versions of an internet-based diabetes self-management support program. *Gen Intern Med. 25(12):1315-22*
15) Global digital population 2019 report (in millions)
16) Grant, R. W., Cagliero, E., Chueh, H. C., & Meigs, J. B. (2005). Internet use among primary care patients with type 2 diabetes: the generation and education gap. *Journal of general internal medicine*, *20*(5), 470-3.
17) Hunt CW. (2015) Technology and diabetes self-management: an integrative review. World Journal of Diabetes.;6(2):225
18) Internet growth statistics https://www.internetworldstats.com/emarketing.html
19) Internet users and 2018 population statistics for Asia https://www.internetworldstats.com/stats3.htm
20) Jakicic JM.(2002), The role of physical activity in prevention and treatment of body weight gain in adults. J Nutr.;132:3826S–29S.
21) Jamal A, Khan SA, Al Humud A, Al-Duhyyim A, Alrashed M, Bin Shabr F, Alteraif A, Almuziri A, Househ M, Qureshi R (2015), Association of Online Health Information-Seeking Behavior and Self-Care Activities Among Type 2 Diabetic Patients in Saudi Arabia. J Med Internet Res. ;17(8):e196. doi: 10.2196/jmir.4312.

22) Kamel Boulos MN, Gammon S, Dixon MC, MacRury SM, Fergusson MJ, Miranda Rodrigues F, et al. (2015), Digital games for type 1 and type 2 diabetes: underpinning theory with three illustrative examples. JMIR Serious Games.;3:e3.
23) Kay M. Rosheim, Jinnet B. Fowles. (1999); Where Do People With Diabetes Obtain Information About Their Disease? Diabetes Spectrum. volume 12 number 3
24) King, H., Aubert, R.E., and Herman, W.H. (1998),Global burden of diabetes, 1995–2025: PREVALENCE, NUMERICAL ESTIMATES, AND PROJECTIONS. DIABETES CARE 21 1414 1431
25) Miller E, Pole A, et al. (2010), Diagnosis Blog: Checking Up on Health Blogs in the Blogosphere J Public Health. 100(8): 151 415 1 9 doi : 10.2105/AJPH.2009.175125 PMCID: PMC2901304
26) N. H. Cho, J. E. Shaw, S. Karuranga, Y. Huang, J. D. Da Rocha Fernandes, A. W.
27) Ohlrogge, B. Malanda (2018), IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Res Clin Pract. Published online Feb 26. doi: 10.1016/j.diabres.2018.02.023
28) N.H.Cho J.E.Shaw S.KarurangaY.Huang J.D.da Rocha Fernandes A.W.Ohlrogge B.Malanda[a] (2018), IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045 Diabetes Research and Clinical Practice Volume 138, Pages 271-281
29) Nannseu et al. (2018), The general public's knowledge of diabetes mellitus: A cross-sectional study in Cameroon. Prim Care Diabetes
30) Pal K, Eastwood SV, Michie S, Farmer A, Barnard ML, Peacock R, et al. (2014), Computer-based interventions to improve self-management in adults with type 2 diabetes: a systematic review and meta-analysis. Diabetes Care.;37:1759–66.
31) Priya Shetty. (2012), Public health: India's diabetes time bomb *Nature* volume 485, pagesS14–S16
32) Purcell GP, Wilson P, Delamothe T (2002), The quality of health information on the internet. BMJ.; 324(7337):557-8.
33) Ranjit Unnikrishnan, Rajendra Pradeepa, Shashank R. Joshi Viswanathan Mohan (2017) Type 2 Diabetes: Demystifying the Global Epidemic Diabetes 2017 Jun; 66(6): 1432 1442.https://doi.org/10.2337/db16-0766
34) Ranjit Unnikrishnan, Rajendra Pradeepa, Shashank R. Joshi Viswanathan Mohan (2017) Type 2 Diabetes: Demystifying the Global Epidemic Diabetes 2017 Jun; 66(6): 1432-1442.https://doi.org/10.2337/db16-0766
35) Sauer IM, Bialek D, Efimova E, Schwartlander R, Pless G, Neuhaus *P*(2005), "Blogs" and "wikis" are valuable software tools for communication within research groups. Artif Organs 29(1):823.
36) Sicree R, Shaw J, Zimmet P. (2009), Diabetes and impaired glucose tolerance. In: Gan D, editor. Diabetes atlas. 4th ed. International Diabetes Federation. Belgium: International Diabetes Federation;. pp. 1–105
37) Song M, Choe MA, Kim KS, Yi MS, Lee I, Kim J, Lee M, Cho YM, Shim YS(2009), An evaluation of Web-based education as an alternative to group lectures for diabetes self-management. Nurs Health Sci. 11(3):277-84.
38) Tang PC, Overhage JM, Chan AS, Brown NL, Aghighi B, Entwistle MP, Hui SL, Hyde SM, Klieman LH, Mitchell CJ, et al.(2013), Online disease management of diabetes: engaging and motivating patients online with enhanced resources-diabetes
39) What is the difference between the Web and the Internet?". *W3C Help and FAQ*. W3C. 2009.
40) Winker MA, Flanagin A, Chi-Lum B, White J, Andrews K, Kennett RL, DeAngelis CD, Musacchio RA (2000), Guidelines for medical and health information sites on the internet: principles governing AMA web sites. American Medical Association. JAMA. 283(12):1600-6.